

THE ART OF STUDY

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To
MY CHILDREN

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PREFACE

SOME time ago, Mr E. G. D. Liveing, Director of the Manchester Station of the B.B.C., suggested that I should broadcast talks to school children on "How to Concentrate." When, in order to advise others, I began myself to "concentrate" I made the better acquaintance of several books on methods of study. My debts to them are acknowledged in this volume. Obviously, however, these books are directed at different types, even different nationalities, of reader. And while they all rightly emphasise the wisdom of working hard and of directing one's energy into the right paths, they do not seem to reflect quite adequately the great pleasure which study can give. This lack suggested the present book.

The notes of the broadcast talks were used as a foundation for lectures on "Effective Methods of Study," recently offered to students entering the University of Manchester. The notes of these lectures, in their turn, have been extended and recast.

The book presents two aspects which nowadays

inevitably draw the fire of orthodox critics. About these two points the author is defiantly unrepentant. The sentences are often in spoken style; a form of writing which is occasionally frowned upon. The reader may, however, be reminded that a lecturer faces his public, in every sense of that word.

For people whose minds detonate automatically on seeing the word "art" in the title of any book, I am sorry. Reluctant as I am to cause another explosion and the ensuing mental disintegration, I can find no other suitable word. The title indicates the existence of an art of study, merely as a guide to Paris might mention the Louvre.

I wish to acknowledge indebtedness for encouragement to Mr Liveing and to Dr J. E. Myers of the University of Manchester. My thanks are due to Miss Marion E. Massey and Mr H. E. O. James for their valuable suggestions, on reading the proofs, and to Miss Mary Oppenheimer, Mrs Julius Thompson and Mr L. B. Yates for kindly preparing the typescript.

T.H.P.

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THE ART OF STUDY

TO THE READER

You tell me you are leaving school this term. You ask for advice which may help you to study efficiently.

I think I know what you mean—more than many people, twice your age, would mean, if they thought of making such a request. But that is unlikely.

You believe that since some people have studied man's attempts to get knowledge, the results of their inquiries may help you. You are right. Effective methods of study are known. To apply them saves time and energy and makes work more attractive.

To catalogue these devices and methods now would be to begin at the wrong end. The reason is clear. You may know how to regulate the ignition and to nurse the engine of a motor-car. A handbook of "tips" could teach you this. But you may want to know why this advice, acted upon, gets the result, and why one tip is some-

times useless while another is just right. This "why" is the science of physics. The "why" behind advice upon methods of learning comes from several studies, one of which is psychology.

You can profitably study how to work as well as how to play. Skill in modern sports can seldom be merely picked up. To acquire any art worth having, needs thought, lessons, imitation (with judicious selection of the right person to imitate), practice, correction, remorse, more thought, more practice. Listen to the "English" which your foreign friend has picked up during his stay in this country. Compare it with Sir Johnston Forbes-Robertson's speech or Mr. Bernard Shaw's writing. Good enough for your friend? Maybe. But for the next three years your chief aim will be to get knowledge and skill. This may be done haltingly, blindly, stupidly, or intelligently, effectively, amusingly. To do it properly will free you for more interesting excursions into the unknown.

It is easy to pick up enough swimming to propel yourself pantingly in four feet of water, enough ski-ing to fall about amusingly on nursery slopes. But staying there for weeks would be dull. If you are healthy, you will soon want to know the best strokes and positions, the best ways of training and

of keeping fit, the best moves and counter-moves in a competitive game. But I wonder if you realise that it is just as desirable to be interested in the best ways to study, to take notes—and to use them afterwards—to utilise a vast, well-catalogued library, to meet a radio-talker half-way.

What will be the result? You will work efficiently, of course. But more ; you will increase your enjoyment. You have the chance now, and not thirty years hence, of becoming an epicure of knowledge. Why not? Conversation, scenery, pictures, music, sport, all give you pleasure now. But you must have met persons who find many different kinds of pleasure in even one of these types of experience ; who know where to look for them, and to find these pleasures at their best ; who know when to enjoy them ; who can see, hear or “think” them in their cultural setting. You can learn some of these desirable things if you rove about and accidentally meet people. But chance may not bring you joy in a Rembrandt and a Corot, in Mozart and Debussy, will not make you a friend of Hans Sachs in the *Meister-singer*, may not suggest the pleasure of seeing an Adam house. For all these joys require some mental background. To paint it in is the dream of many a grown-up who, till now, has had—or

thinks he has had—no time for it. You have the chance, and the time.

Some of your elders are occasionally paralysed by that hoary legend that if you should be told by someone else about the delightful things in life, or—worse still—why someone else likes them, the springs of your own precious unique enjoyment will immediately dry up. It sounds like a grimmer Grimm's fairy tale. Don't believe it. It often forms a drone-bass accompaniment to jaundiced attacks upon "the lesson in appreciation," of music or art. There must, of course, be some bad lessons on these subjects, as on all others. But, as an antidote, read Percy Scholes's *Listener's Guide to Music*.

If you are still unconvinced, ask someone, aged fifty-five, who "knows what is what," where you can see good pictures and hear fine symphonies and operas, who are the best living builders, writers, speakers, stage and film actors, and where you can get interesting meals, artistically and cheaply cooked. (Even if you are out of reach of many of these joys you will be no worse for knowing where they can be found.)

Now ask how long it took him to learn about these things. Did he discover them casually as water runs downhill, or was he helped by friends, books, guides and maps? There is room in

modern life not only for guides to knowledge but also for advice about the process of getting that knowledge.

I expect you hold that excellent but inadequate belief that to study effectively you must think clearly and work hard. It is true, of course, within limits. But, just as if you wish to discover new lands, or even to get about old ones, walking steadily and persevering is not enough, so it is with the finding of knowledge. The intrepid, resolute explorer, without a map, will explore with unnecessary intrepidity, undaunted by a mountain round which there is a pass unknown to him. To use the map would save energy for a later unavoidable climb.

Let us apply this illustration to our problem, the pursuit of knowledge. While some books are hard because their subjects are really difficult, others are elusive because they are obscurely written. The fog they create hides the mountain pass. You find Chapter VI of a book difficult, I to V having been quite clear. Discover if this is entirely your fault. An expert in the subject might tell you that nobody knows what Mr. X was driving at when he wrote that chapter ; perhaps, even, that this encouraged Dr. Y, of whom you have not yet heard, to put the matter clearly in a later book. Consult the expert if

you can. Put in your strokes where they will tell. Great swimmers never disdain the help of a friendly current.

This is not advising you to be afraid of difficulties, and at all costs to make a bee-line for the primrose path. It merely urges the value of knowing, when staggering in a bog, that near you is a path worth trying to find.

Much valuable knowledge cannot be attained without hard work. But that this work must necessarily be unpleasant I do not believe. Many teachers have urged that painfulness—though they seldom use this word—is essential in the educative process. I shall not try even to outline this vast question here. But sometimes one suspects that the person who proposes this view is shouting down a small voice of conscience which hints that he himself is teaching lazily, complacently, stupidly. Curiously enough, most adults agree that when they were at school it was the badly-taught subjects which hurt them. And yet, if a contractor delayed to drain, level, and light a street (I as a householder having innocently paid him in advance), urging, as a reason, the excellent training given to eyes and muscles by finding one's way through a dark swamp, I might question his singleness of motive. There will be plenty of opportunity for you to conquer

unpleasant things, but before you toil through a big book, make sure that it is worth the toil. Text-books are like Brazil-nuts ; bad ones are quite common and apparently inevitable. Find the good ones.

CHAPTER I

WHAT IS LEARNING ?

I WELCOME your suggestion that I should try to say what is meant by learning. Let us begin at this point ; you grasp, I suppose, that after you have learnt anything, you are to that extent a different person, in body and mind. But while learning an irregular verb will alter you a little, learning to drive a car—and all that it implies—will alter you considerably.

I would next suggest that you get this idea quite clear, that while it is often helpful to learn by your own experience, in this mechanical age many things must be learned without it ; for example, the inadvisability of handling “live” switches, or of driving fast on ice-bound roads.

If so, why were people in the past urged to “learn by experience” ? There was less to learn ; only the few had a chance to learn many things ; little of the material to be learnt depended upon powerful and dangerous machinery and chemicals. Many could not read at all, and there

was little to read. But universal reading and writing, the camera, posters, the "blue-print" have changed all this. To profit by a man's experience, we don't need, or wish, to see or hear him. We may prefer to see his maps and diagrams. If his face or voice warrant the effort, we may wish to see or hear him. We don't believe that a person, famed for one facet of his personality, will necessarily shine with another.

So, nowadays, reading and listening will take you much further than they used to. Obviously reading an article by an expert will not give you his knowledge or his taste. Taste takes time to mature, but this process can be helped, and some tastes may be kept too long. Don't be paralysed by the belief that youthful taste is necessarily crude, even if sometimes it is unnecessarily so.

It is clear that if you go about it rightly, you can soon acquire some knowledge which took a very long time to collect. Not only *can* you learn by others' experience ; the world has become so complex that people will often show an imperative desire for you to learn in this way.

What, then, is learning ? Here is a list of the different events which are confused under this term.

- (1) Past experience may move a person to per-

form some action when a certain situation arises. My easy-going spaniel, who often travels, quickly "learns" his new sleeping-place. When night comes, if the word "kennel" be thrown at him and a biscuit into a corner, he will go to sleep there. Next night, at bedtime, he may even go there spontaneously. He learns by a single experience. Intelligent? Perhaps. It might be more intelligent, though from our standpoint less moral, to seek a chair after we had gone. Connecting simple behaviour with a simple situation is a relatively simple business. Such ability, which you and I display; and the dog, and—lest we become proud in canine company—the crayfish, too, is perhaps the foundation of all behaviour.

(2) After experience, he may be able to understand a series of events, as, for example, how a radio set works. He may simply remember that it has low- and high-tension batteries, valves of different size, a loud-speaker and three dials. But if he remembers the different functions of the two kinds of battery, why the earth connection must be good, the aerial high and long, it usually means that he grasps the relationship not only between the visible parts of the set, but between things not seen by anyone, *e.g.*, the ether and the carrier wave.

- ✓ (3) He may acquire the art of moving his limbs suitably in certain circumstances, *e.g.*, to drive a golf-ball or sail a yacht.
- ✓ (4) He may come to feel appropriately at certain moments, *e.g.*, when having accidentally annoyed a friend, he correctly interprets the friend's facial expression and behaviour.

School and the University probably offer you the most chances of these acts of learning. They differ in many interesting ways. But in one they are alike ; they all give increased power over the land, the sea, the air, the ether, animals, other people and yourselves.

¹⁵ All knowledge is power. But, after practice, power may come so easily that we hardly recognise it as such, calling it habit. Sailing a yacht may become a habit, but so may using the subjunctive in German. In each case a special situation may evoke the right response, even if we know nothing of mechanics or grammar.

A higher type of learning leads us to know about things instead of merely being acquainted with them. We then understand how the parts of the object fit into each other, and how the thing is related to other things. This is the kind of knowledge which leads to invention.

CHAPTER II

HOW ANIMALS LEARN AND HOW WE LEARN

PERHAPS the simplest learning is setting up a habit. A *habit*, like that of opening one's front door with the right key, is a special response to a special situation. It is acquired during the individual's lifetime. In this it differs from an *instinct* which, in man, is a more general response to a more general situation, is inherited, and characterises the species. Different human beings will show an instinct like rage in similar ways, because their behaviour is due to inborn patterns of bodily control. But in such an action as hitting a ball, we observe that the same person may smite a cricket ball, a base-ball, a tennis ball, and a golf ball in different ways. For he acquired these habits by practice and observation. He was not born with them, as he was born with the ability to breathe, to suck or to cry.

But, you will ask, does not man show *general habits*, such as punctuality, neatness, kindness? If habit and instinct be defined as above—and

there is no room here for more than the dogmatic assertion that these seem to me to be the most useful meanings of these words—the view supported by evidence is that there are no general habits. Not a few persons who appear to be generally punctual, neat or kind may, in some situations or towards some persons, exhibit striking exceptions to their usual behaviour. Their virtues arise from *attitudes and sentiments*.¹

Much human learning, especially of the unintelligent kind, is merely forming habits. Some people do little more. But in this they resemble the animals, who easily learn simple habits.

A clear example of this is the difference between army drill and training. The aim of drill is to set up habits. Good training goes beyond this. It should teach a person when and where his habits, however excellent, should and should not come into play. The history of modern warfare tragically illustrates this.

A short study of the ways in which animals learn will help us to understand our own learning, so long as we are not too modest about the differences between our own minds and those of animals. Observers have watched carefully the formation of habits by the bird, the rat, the cat,

¹ The rôle of these in behaviour is discussed on pages 111-114.

the dog and different kinds of monkey. The times taken by them to form certain habits have been graphed. Recently, similar problems of behaviour have been set to chimpanzees and to children, and the results compared.

Let us examine the kind of problem set to either an animal or a human being. Food, which the animals desire, is presented to them enclosed in a box fastened by one or two buttons, bolts or strings. The type of attempts to open it, the time spent in trying, and the improvements from day to day are all recorded.

In the early experiments, a hungry cat was placed inside the box and the food outside. We live and learn. It was rightly objected that this arrangement cramped the cats' style. The situation is foreign to them. It stirs them up emotionally and may frustrate intelligent action. Indeed, critics have speculated concerning the results if, at 1 p.m. some irritable gentlemen from clubs were secured in cages with puzzle-locks while their lunch was offered them outside. Perhaps they, too, might begin by scrabbling in a random manner.

In later experiments, the animal found itself outside and the food inside the box. This is more natural.

By these and other experiments, the animals

were observed to use three different ways of learning.

- ✓ (1) Many random trials, followed by success. The next time the animal was put into the box it had not learnt the trick. But each day its fumbings were fewer. Eventually they diminished to nothing. This is the way in which many people learn games. "Trial and error," "trial and success" and "display of initiative," are three titles, displaying different degrees of optimism, for the same process.

- (2) Imitating successful learners.

Anyone who has not studied animals experimentally will be surprised to learn how little, in such conditions, they imitate. A cat put in the puzzle-box with another which could get out, did not profit by watching. A rat, watching another, profited, but not directly. He simply stole the successful one's food. Monkeys, when the task came within the sphere of their experience, showed some signs of imitation, but scarcely as many as would popularly have been expected. Even the imitative acts of chimpanzees were clumsy and laborious.

- (3) The other way of learning is by noticing relationships between things, or by

“insight,” *e.g.*, by realising that until the bolt is shot, the button cannot move, or that a desired banana must be first pushed *away* from the animal, and then round a corner.

We may illustrate these three forms by an example of human learning. Here, let us say, is a valve set, and before it a person who has never used one. Suppose him to learn in ways 1, or 2, or 3.

(1) He pulls out all buttons, pushes down all switches, twiddles all dials, singly or separately, and perseveres. He may—he will—get a result!

(2) He watches an expert manipulator. The learner notes that he must (*a*) close the switch on the wall, (*b*) pull out the bottom button, (*c*) turn the left-hand dial backwards and forwards until he hears music, repeating this swinging with decreasing movements, until the sound is loudest, (*d*) turn the middle dial gradually to the right until the sound improves in loudness without deteriorating in quality.

(2) is a good method, with a drawback. If the set is working well, the imitator will probably get good results. If there is no result, however, he will be unable to change his behaviour except by method (1).

Turning to method (3), let us suppose that, armed with a little knowledge, he asks questions. He learns that (a), above, is the "earth" switch, (b) the current switch, (c) the tuning dial, and (d) the control of "reaction." He will have learnt intelligently, the more so if he understands the processes of "tuning" and "reaction" even superficially.

This example illustrates the difference between blind learning and thoughtful learning.

I cannot over-emphasise the importance in lessons, in speech, in games, of doing the first things right. It is often very helpful not to know how things are done wrong. This is never doubted in the case of learning a foreign language. You would not teach English to a Frenchman by letting him pick up distorted vowel-sounds and then purify them. Yet the foolish insistence on excessive "learning by experience" misses this point. Many things in this complicated modern world must be learnt by other people's experience. Science is an attempt to record that experience clearly and concisely.

We may, perhaps, usefully finish this chapter by summarising the different possible kinds of learning.¹ When a person has learnt something

¹ This classification is suggested by the writings of Professor W. F. Book. Cf. his *Learning How to Study and Work Effectively*, London, 1926.

he is a different individual. His mind and his body have been changed in various ways.

He may have learned to observe facts; that is, to focus them clearly and to distinguish them from their surroundings. He will learn their names, what they are for, what they will do for or to him. He may then learn how to fix such names of facts in his memory, and to recall them quickly, faithfully and with certainty. After recalling them, he may use them in new connections.

He may learn how to deal more efficiently with new situations, to decide whether they can be classed as types known to him, or whether he must learn new types. He may learn how to learn. He may acquire information, or book learning. He may acquire skill. He may learn how to enjoy some pleasures which are not for the simple, untutored mind, *e.g.*, the higher performances in literature, science, music or art.

CHAPTER III

DIFFERENCES IN EASE OF LEARNING

EVERYONE knows that our bodies show great differences. We all exhibit the most varied shapes. Our own faces differ from others to an extent which, though we take it for granted, is a great tribute to the discriminating power of our eyes. But while bodies are flagrantly different, teachers and others often proceed as if minds are not. The same methods of learning are offered to various minds, though they need quite different treatment.

Now, just as one man's body may make him a good hewer of coal, and another's a good surgeon, different minds require different kinds of learning. Of course a teacher cannot pay much attention to individual differences in a large class. That does not prevent them from existing.

To say that different kinds of learning are easy to different persons is not to imply that the easy things will be interesting and the hard things dull. This is a common and untrue belief. Many who

are keenly interested in "wireless," find terms like "capacity" and "inductance" very hard to understand, and among those who think they understand them, there must be some honest souls who suspect that they grasp only a little. Many schoolboys can explain "satisfactorily" why a wireless set must be "earthed," though a researcher might be less satisfied with their account.

Conversely, easy subjects are not necessarily interesting. At school, possibly, you concentrated on the subjects you could do. But when examination days are over, you may find the difficult things, though less "safe," more interesting. Some persons, to whom arithmetic is easy, are not interested in sizes, shapes or calculations of dimensions. There is, indeed, a type of mind which is most attracted by matters that it cannot understand, turning away from those which it grasps, just as there are people who like finding their way through trackless jungles, and others who prefer a tram-ride.

Differences of Mental Imagery

Minds differ importantly in the manner in which, and in the apparatus with which they remember. One man has "pictures in his head"; images "flash upon his inward eye." To him

this seems natural, even inevitable, but, maybe, his own brother can hardly believe that anyone could remember in such a fantastic way. Another man can "hear in his mind's ear" the voices, noises or music. Wagner is said to have composed the Prelude to the *Rheingold* on springing up from sleep in which he had heard the music. Beethoven made great symphonies long after he ceased to hear the music of the outside world.

We must not jump to the conclusion that Beethoven must necessarily have composed by means of auditory imagery. For musicians can "remember" with the muscles required to play an instrument.¹ The muscles for song or for whistling can give them characteristic sensations. These sensations, or the memories of them, can carry the meaning of their thought.

Common among students is the "verbaliser," who remembers with words. These are often experienced as muscular sensations in throat or mouth. While thinking, the verbaliser mutters to himself, noisily or noiselessly. But words may be imaged in other ways. The person may hear them spoken, either by himself or another. This is very useful when trying to remember conversations. But the words may be visualised as they

¹ For an extremely interesting account of this see G. H. Thomson, *Instinct, Intelligence and Character*, London, 1924, pp. 97—100.

appeared. Many who do not visualise words can often "see" the size of sheet on which they appeared ; the type and the part of the page. I find this a useful way of remembering where and in whose book I have read a passage.

Some, when they remember, feel themselves writing. I knew a man who used to say that he could not think without a pen in his hand. If he had no pen, with anything pointed he would make marks, meaningless to others, but presumably intelligible to himself, on any handy surface. My attention was drawn to this peculiarity when my furniture was thus favoured.

Still others, while remembering, feel themselves drawing. Some indeed cannot recall the shape of a country, unless they have previously drawn it.

Few, if any, are tied down to *one* mode of "imaging" ; for all these ways of recall are imaging. Yet probably most persons prefer one kind of imagery to others, and seldom use certain other kinds. Unfortunately, some writers with little or no imagery of their own, and that verbal, have not refrained from defining the limitations of visual imagery—as they conceive them—in visualisers. There was once a fox who lost his tail . . . About this a chapter could be written, but not here.

Many persons use one type of imagery so

habitually that they find certain kinds of learning easy and others hard. I have little difficulty in learning by heart, but much in convincing myself that it is worth the effort. And while some things, *e.g.*, definitions, must be learnt by heart, others need not be. To judge which tasks fall into the former class requires experience in study. But if the student knows his own strength and weaknesses in imaging he can make his learning easier and pleasanter. Practical hints in this respect will be given in Chapter VIII.

Quite apart from differences in imagery, some people find it easiest to remember *things*, others *words*, and still others, *general ideas*. These three classes commonly regard each other with contempt. The practical man or woman, the artist, the artisan, usually tend to remember things. They believe in doing, not talking. This is a wise provision of Nature, as one may note when they do talk. Sometimes they fail verbally because they cannot handle ideas not expressed in their own technical terms. A practical engineer once declared himself to me as very sceptical of many psychological assumptions. But he believed in telepathy. He said he could prove that it followed the law of the inverse square. And he did, to his own satisfaction.

Those who think with (not in) words enjoy

several privileges. Many words have been invented to stand for general ideas. "Representative government" would be difficult, though not impossible, to depict visually. Words are, or may become, public property. They can be translated, with more or less success, into other languages. Yet try rendering the German *Gemütlichkeit* into English, or *home* into German. And when you hear Wagner's operas in English, try, for his sake, to believe that he seldom meant just that !

✓ Words save centuries of time. If we wish to express ourselves publicly, or to transmit our meaning unmistakably, we may use legal words. But even these, as lawyers know, are sometimes variously interpreted.

Words help us to think ; to make matters clear to ourselves. But sometimes words discourage us from thinking. Those denoting political classifications often do so.

Words may be beautiful ; "A rose-red city, half as old as Time," may alleviate a dull journey in a stuffy train through wickedly ugly industrial towns.

But one half the world doesn't know how the other half lives. And so verbalisers often under-rate the usefulness of other kinds of imagery. They sometimes object that visual imagery is

"tied down" to the object which it depicts, a mere photograph, so to speak. (Chorus of protest from modern photographers!) But visual imagery is often a portrait or cartoon, rather than a photograph. A portrait can convey more than could be said in words conveniently, safely, or at all. But a visual image may also resemble, or be, a diagram, representing the essence of a subject, shorn of distracting, irrelevant detail. It is permissible to wonder if some who write of the defects of visual imagery have ever seen a map, or heard of the glories of contour lines.

It is possible to think in general meanings or *notions*, such as truth, credit, monarchy, peace, infinity. Some persons, especially those whose daily business it is to do such thinking, claim that they often think in this manner, and not with the aid of pictures, sounds or words. Such a notion as "international understanding" or "deflation of the currency," can be held in the mind of a philosopher or economist without any necessary picture of a bouquet of ambassadors of different hue, or of the gradual subsidence of a blown-up gold disc. This is obvious, but to discuss how far such thoughts would be "cribb'd, cabined and confined" by really illustrative imagery, would need a volume. To the thinker with images, many people who professionally think abstractly

seem as if they would be no worse for the occasional visitation of a concrete example. Algebra is useful because it frees one from arithmetic. But a testing by arithmetic may remind us that the algebra is dealing with negative quantities. The thinker who has risen above imagery may have bought his freedom dearly.

In leaving this controversial but important matter I would not say that verbalisers are naturally tempted to compare the lowest forms of visual imagery with the highest forms of verbal imagery. But recently things have been pointing that way.

You will now, I hope, have read enough to grasp that, just as some athletes specialise in the high jump and have to leave cross-country running alone, or cultivate it only for amusement, so you should find out by observation, and cultivate your best ways of learning and recalling. Do not *assume* that any method is good if only you work hard at it. The method which your friend has found successful will not, for that reason alone, suit you.

Quickness of learning and permanence of retention

Some people learn rapidly and easily. We cannot explain this by the mere phrase "a good memory." A "good body" is never offered to explain why a particular person is a good dancer

and a good tennis player. People who are said to have a good memory have often hit upon, or been taught, good methods of memorising, just as nowadays really good tennis players are those who have been taught well.

Now of these favoured memorisers, before the days of experimental psychology, it was often said "easy come, easy go." The chief ground for this statement is the belief that Nature makes up for remissness in one respect by gifts in another, or—the belief in the present context—restores the balance by spitefulness in one respect if she has been kind in another. Experiment shows that though the relation between rapidity of learning and permanence of retention is complex, there is no ground for the beliefs quoted above. People who learn quickly are apt to have retentive memories. This is because quick learning is often due to natural advantages such as imagery, interest, and to the use of good methods, especially of those which avoid the learning and subsequent unlearning of wrong things.

Confidence in recalling

Some people recall with more confidence than others. This is partly due to individual differences of mentality. But such memory-confidence like confidence when swimming out of one's depth,

can be acquired by using good methods of learning and recall. A man who has learned to swim in four feet of water may be dismayed if he is suddenly asked to swim in seven. But if he has been taught well, he ought to believe his teacher's assurance that seven feet of water offer no more difficulties than four.

Lecturers, lawyers, doctors, and others who have constantly to recall facts, soon discover that their memories are more trustworthy than they supposed. It has been said "If you are in good health anything which comes to you compellingly as a memory is likely to be correct." Probably many persons distrust many of their memories to such an extent that they are not encouraged to stay in consciousness after they show their faces.

CHAPTER IV

HOW TO LISTEN

WE listen to get information, but not for this alone. It may be to take pleasure in sounds. These need not be made by instruments, or even by vocalists. Some speaking voices are a joy to the delicate ear, which may take a triple delight in what is said, the way it is said and the voice which says it. Such ears might oftener be thus thrice-blessed if, while radio-technique improved, television were delayed for a few years.

The rival way of getting knowledge or pleasure, through the eye, is so attractive that few have the art of listening to speech. As I write, an advertisement of a camera tells me "Nobody listens nowadays, but everybody looks." Not quite true, if we may judge from advertisements on adjacent pages. But—radio and gramophone apart—it fairly describes modern habits.

Even to-day, some people listen more easily and readily than others. They may simply enjoy, especially when lonely, friendly human noises, or,

if they are epicures, may love the sound and swing of the phrases. When remembering or thinking they may be helped by hearing their own or other people's voices "in the mind's ear." To learn the art of listening is possible, but one should choose the right noises.

Facts designed for the eye and the ear

Some kinds of information are best acquired through the eye, others through the ear. Some is definitely unsuitable for the ear, particularly if it is best offered in spatial forms, for to distinguish and interpret them is the eye's privilege. The ear's appreciation of space is notoriously bad. Classifications and relationships are eminently suitable for blackboards or lantern-slides rather than for vocal description.

Mere collections of facts are usually best read by the student, if he has learned *how* to read ! By this is meant much more than merely translating black shapes into words.

To awaken interest in a theme, to throw unexpected bridges between it and others, to illustrate general statements, to enforce, to dramatise an opinion, most expositors will prefer to speak. Spoken and written English differ completely, and ought to differ, in style. From the artistic standpoint little can be said for, and much

against, the public reading of matter which, composed in "writing-style," professes to be a "talk." The quality of the matter occasionally, though seldom, atones for such a makeshift. A famous scientist, who knew his strength and weakness, when invited to lecture, used to answer that he would read a paper, refusing to sail under false colours.

In universities it is whispered that some lectures need never be given. I would agree, with many footnote-remarks. The first would be that this attitude is often encouraged by persons who themselves happening to learn most easily through the eye, neglect or are ignorant of the wide differences between minds. At least one great thinker who disparages listening has been known to make pitiful sounds on a platform.

Of any student who wishes to be excused from attending lectures, it might fairly be required that he should be (a) diligent, (b) interested, (c) able to sift evidence and to weigh opinions, (d) able to read technical French and German easily enough to glance at new publications and to seize upon important contributions, (e) rather more intelligent than his classmates. Many sturdy objectors to lectures might find it difficult to satisfy (e).

Different art-forms in speech

I would urge that the best type of school-lesson and the best type of lecture are entirely different art-forms. It is unreasonable to quarrel with a tone-poem because it is not a fugue, yet a lecture is often grumbled at by persons who evidently expected a lesson.

I would suggest that the chief aim of a lesson is to give information, while that of a lecture is usually to offer, to compare, to contrast and to relate facts and points of view. If a man takes a lesson on a tennis stroke, he does not want a historical setting beginning with, say, Henry V., and ending with himself. What he hopes for is analytic dissection of his own skill, a precise statement and illustration of his faults, encouragement to correct them, and criticism, positive as well as negative, of his attempts in this direction. This would make a dull lecture. But tennis-in-general offers material for fascinating lectures.

You may ask, if the teacher talks in this way, does he become a lecturer? There is nothing to prevent a teacher giving a lecture, except, perhaps, the fact that he is a teacher. A lecturer should be able, if necessary, to state quite neutrally a belief or theory with which he disagrees. The intense sentiments which give the teacher his driving force,

and, maybe, his *raison d'être*, make this neutrality uniquely difficult for him.

Yet the lectures which give only concrete facts already available in text-books (not, of course, lecture-demonstrations or illustrated lectures) are for many students a waste of time. As spoken matter, they are harder to grasp than the information available in the lecturer's published text-book, or potentially available in the one which he declines to publish. Most of us have frittered away hours of our young lives at such lectures.

Let us sum this up. There are different kinds of (even good) lectures. The first type is didactic. ¹ It gives you facts, not easily available in another form. For those minds which learn best by hearing, this kind of lecture is excellent. For many students it is an infliction.

The next kind is instructional ; it puts in order ² many things, most of which, maybe, you knew already. A first-class lecturer arranges facts in an order proper for the special occasion. This involves efforts far too strenuous for many modern lecturers.

A third type of lecture is inspirational. It ³ makes you want to do something which, before attending the lecture, you did not want very much to do.

You can scarcely expect a lecturer to tell you

beforehand how he is going to lecture, any more than you can insist that a musician shall say beforehand how he is going to play.

Possible developments of listening

Looking at pictures ; listening to music ; some privileged possessors of these arts are now sharing them with thousands of ordinary people. Yet the art of obtaining the fullest enjoyment and profit from listening to speech has attracted little notice. While many people have reasoned preferences for certain kinds of music, and state them in terms which imply previous analysis, few can say more than that they like or dislike a speaking voice. Tens of thousands learn music, in this country alone. How many study the art of spoken speech and the science of its production, phonetics ? In the last twenty years people have become better-looking ; at least, their alterable aspects show signs of more careful tending. Yet vast areas of the globe still contain civilised persons who make inelegant noises when they speak, and—a sign of grace—often know it. Perhaps the country which has set an example in personal daintiness and hygiene may adopt a slogan, “Better voices !” And—such is the power of slogans—the rest might follow. It is early to predict which turning the “talkies” will take

when they have outgrown their many childish ailments, but should attractive voices become commercially valuable, much might happen.

Children and simple people like listening. Many lose this pleasure later ; some because they form the habit of turning the other person's solo into a duet. But the greatest—and rightful—enemy of listening was reading, until aërials began to appear in back gardens.

People may ask "Why listen to a tale for twenty minutes when you can read it in five?" Yes, but why listen to an opera when you can read the score? Why hear the ceremony of the King's Keys broadcast from the Tower of London? It could be described on a telegram form.

This may illustrate the point. As broadcasting develops, people are learning once more how to talk to hearers. It was high time that something of the kind happened; at least, some of us had fallen into the bad habit of reading poetry exclusively with our eyes, disregarding the hopes which, presumably, caused the poet to offer his lines for publication.

If you are a bad listener to speech (I used to be) try listening to a good talk as if to music. Try to live yourself into the sounds and their meanings; to share the speaker's changing vocal moods as you would sympathise with his facial expression

or gestures. Listen to some speakers as if you intended to copy their sounds. Sometimes, in such a way, you may grasp, primitively, the speaker's point.

The case against lectures

I hope the last few pages have made it clear that though much can be said against lectures, what is usually said seems scarcely to the point. Yet I mention with great respect a criticism of University lectures (incidental to an attack upon Universities as we know them at present) by Mr H. G. Wells in the third volume of *The World of William Clissold*.

It contains a sketch of the way in which University education might be conducted. We could "in an open conspiracy," "not so much attack as disregard and neglect, supersede and efface" much university teaching, "through the steadfast development of a new world-wide organism of education and intercourse, press, books, encyclopædias, organised translations, conferences, research institutions."¹

The new institutions would be research and post-graduate colleges, offering no general education at all, no graduation in arts or science or wisdom. The people who come would be

¹ Page 735.

specially attracted. They would want to work in close relation, as assistants, secretaries, special pupils, investigators, with devoted and distinguished men whose results are teaching all the world. Mr Clissold speaks of "our ancient, secluded learning places where knowledge is given almost furtively by word of mouth." "There is no need whatever, now," he says, "for anyone to suffer and inflict an ordinary course of lectures again. We cannot have our able teachers wasting and wearying their voices any longer in the lecture-rooms of provincial towns; we want them to speak to all the world. And it must be through a literature made accessible by translations into every prevalent language."

Here a thinker with one type of mind is suggesting his favourite type of education for persons who may be of another. Mr Wells prefers to get his information by reading. So, with thousands of others, do I. I am usually a bad and impatient listener. Spoken speech (like some music) is often but an *obbligato* to my own visual images. I prefer to see a complex statement in writing. Yet many persons learn best and are inspired by hearing the human voice. All the same, most people, especially most university teachers, would be better for reading that provocative third volume.

Another side of the question is put by Sir John Adams.¹

I can mention here only a few of his points. Some people who are said to be good listeners are merely good actors. To others they look as if they are listening. The student, however, must not only appear to listen—though it is rather pleasant for the lecturer if he does—he must really listen ; must give his mind to what is being said.

In a lecture the strain of listening is great. Lecturing should be “bipolar.” The listener ought to be asking himself “When the lecturer comes to this point, will he take this direction or that ? ”

As Sir John Adams indicates, to take note is not quite the same thing as to take notes. Sometimes indeed the two may be antagonistic.

His book, and Professor L. A. Headley’s (page 346–350) give most valuable hints about note-taking, in fuller detail than is possible here. But I have tried to set down a few comments which may be useful.

It is only right to distinguish between various forms of note-taking. First, there is the verbatim report. Fortunately few students could follow the average lecturer fast enough to make one,

¹ *The Student's Guide* (London) : Chapter VIII, on “Listening and Note-taking.”

For if the lecture is so full of matter that every sentence is essential, the lecture is overloaded, and the lecturer unwise. If the lecture is inspirational, its written report will probably look unconvincing, even foolish.

Perhaps the lecture offers matter which at the moment is not to be obtained elsewhere. Then it seems necessary to write it down. But ask yourself if it will be published ; if, indeed, the lecturer has not been forced to turn into spoken style his thoughts which lie before him on his desk in written style.

It is a lecturer's chief function to present facts in the most effective way, rather than to expound vocally information of which he has the monopoly. For this reason a lecture upon something which is expounded in your text-book may be extremely useful for you, if it instructs.

Most lectures contain padding. As Sir John Adams points out, padding in a lecture is as useful and as necessary as connective tissue in the human body. In its negative way it is of vital importance. After all, the difference between your good-looking and your less good-looking friends can often be attributed to the quantity and distribution of their connective tissue. And so with lectures.

In one kind of note-taking—worse than the first—the student writes in longhand as much of

the lecture as he can. This makes the lecturer into a dictator. Any dictator-lecturers who are left ought to justify their behaviour. A few can. They pause every ten minutes or so, and dictate a paragraph containing the substance of what has been said. This may be very useful in lectures on the more difficult aspects of abstract subjects.

A third kind of note-taking consists in recording only striking facts or expressions. If these notes are amplified quite soon afterwards, the record may be very inspiring. The act of elaborating the notes revives and probably deepens the impression made during the lecture. Yet to make good notes of this type one must know what to record. This in its turn implies that one already knows not a little about the subject.

There is a type of super-note-taker who discovers the lecturer's headings and his plans as they develop. This very desirable ability can be practised, by analysing a good published lecture. Such exercise would harm few newspaper-reporters of lectures.

In Professor Leal A. Headley's book¹ are given most valuable detailed hints for taking notes, for writing them up and for using them.

¹ *How to Study in College* (New York).

CHAPTER V

HOW TO CONCENTRATE

WHEN people ask "How can I concentrate upon study?" they usually have in mind some subject which they do not like. Johnny concentrates easily upon studying the specification of a sports-model car; with less facility upon irregular verbs. This chapter will deal not only with Johnny's very comprehensible difficulty, but with that of some students who find it hard to concentrate even upon subjects in which they are moderately interested.

First, a few remarks about *attention*. You can focus your eyes upon anything which is visible and within their range. This is possible, whether the object is simple and familiar or complicated and unusual. Now people often suppose, and wrongly, that we have a single power of attention which, like a searchlight, can be directed equally well upon anything. But they find that it will not stay long upon some things like the integral calculus, while it will stay upon others. So, to

explain the fact that some people can continue thinking about the integral calculus, though when babies, they could not have been naturally interested in it, a belief arose in the power of attention or of concentration. But psychologists have found that the word "attention" points to, and sometimes covers up, a multitude of problems.

Let us begin with a simple description. We may be aware, more or less clearly, of our experience. It seems to have a focus of greatest clearness and a margin of unclearness. Whatever else happens to an object seen, heard, touched or smelt, when we attend to it, it certainly becomes clearer. There are some bodily causes of this. Your eyes are focussed for seeing, your body directed and your ears adjusted for listening. There is even a little muscle to pull your ear-drums tighter.

But there are mental factors, too. In a clearly printed English sentence, its meaning is to me the most important aspect. If it were in Russian, my eyes could focus the words just as clearly, but they would have no meaning. So enhanced clearness of *sensation* is only one result of attention, and, in study, it is seldom as important as increased clearness of meaning.

When you make things clear in the focus of a lens, you can still see objects in its margin un-

clearly, because of the increased brightness in the focus. So you clarify one thing in the field of experience at the expense of others.

Attention is never continuous. It is like a searchlight, directed by the hand upon an object in the darkness. One's hand may be jolted; even if it is not, it will naturally vibrate slightly, and jerk the light away. The holder of the light may learn to keep the object illuminated; to control his hands, and the moment he loses the object, to know where to search for it.

Similarly, since we cannot prevent fluctuations in our attention, how can we make them as infrequent or as unimportant as possible? And how can we "get back" quickly after a lapse of attention?

Let us take the last question first. We can adopt a device recommended by Professor H. D. Kitson, in his useful book, *How to Use Your Mind*. Before you begin a period of study, resolve to use the first lapse of attention as a reminder of the subject from which you have strayed. One way is to write in bold characters on a pad by your side, key-words in the course of your reading. Make a mental association, as a lecturer does, between being distracted, and glancing at the pad. Obvious, but how few do it! It will save you from many hours of profitless day-dreaming.

Furthermore, rid yourself as soon as possible of

the mental attitude which regards an interruption (a breach of continuity) as *necessarily* a distraction (a drawing-away from your course). Behind this attitude there often lurks an unconscious desire.

Prevention is better than cure. So before beginning to study, remove all distracting objects from your sight. Work, if you can, at a table containing nothing but the things which you require for that hour's study—and a few flowers in a vase to preserve you from mental stuffiness. Remember that books and papers especially are distracting objects. You may think that books upon the subject which you are studying are surely permissible, even stimulating. Unless you are certain you will want them, put them behind you, literally and metaphorically. For browsing on some other part of the subject may give you an apparently good excuse for avoiding your immediate difficulty. That difficulty has a way of cropping up nastily on another day.

How we become interested in study

Readers who are still at school, or have only just left it, may not realise that, on growing up, they may wisely take stock of their interests. At school possibly (there are schools *and* schools) you were “supposed” to be interested in all the subjects. You were not encouraged to offer as

excuse for a bad performance your lack of interest in it. "The world is so full of a number of things" that a properly educated person should have few dull moments. Still, if you are equally interested in all of them you will never get anywhere.

You may find, however, that though you wish very hard to be interested in some subject, you cannot. How can you develop interest?

To answer this, we must distinguish between primary or instinctive, and secondary or derived interest. A baby and a dog, both two years old, brought up together, will have many common interests. They may compete for biscuits, they may both become excited when the nurse puts on her outdoor coat, they may meet the mistress of the house with similarly charming curves. But upon these primary concerns derived ones are soon grafted. In this process the child rapidly leaves the dog behind. The dog becomes secondarily interested in an otherwise dull cupboard because it holds biscuits; the child makes room in his mind for one more cupboard, because in it are his picture-books. This leads us to the clue to our problems. A human being may develop curiosity about the most artificial and abstract things, if only he grafts them upon primary interests as early as possible. Sometimes, even

in a subject which we find difficult and towards which we feel lazy, some primary interest may arise unexpectedly, our derived interest may fuse with it and develop immediately.

Suppose a man, who, as a boy, learned a little German, found it difficult and uninteresting. Nowadays he wishes vaguely that he knew more, but never takes any practical steps. He now becomes a violent convert to winter sports. They cause him to fall in love with a Swiss village. Its inhabitants speak the language which he found dull and difficult. With a glow of delight he finds that he can read a few station notices. With a stab of envy he hears his friends getting ten times as much as he from their ski-ing lessons, by asking the instructor difficult questions and insisting upon adequate answers, in German. He comes home determined to learn the language ; but the incentive is now less. Instead, he makes a valve-set. Again, when listening to the Continent, the little German he knows tantalises him. He now learns the language seriously. He realises that the difficulty or impossibility of faithful translation from German into English, formerly an annoying snag, is really a fascinating fact. Eventually he becomes keen about language in general.

Notice that the instinctive forces which altered

his attitude towards a formerly unattractive subject were connected with the interests of himself and his friends, not with "things" or "subjects." The average individual's interest begins in this way ; in persons first, in things afterwards. And, except for highly cultured people, most values in life are, and remain, human values. For the average man Everest was scarcely more than a name in a geography book until men tried to climb it. For most people the human significance of the North and South Poles overwhelms their scientific interest.

How, then, do we usually acquire interest in subjects which offer no obvious lures to our curiosity? I am not forgetting, but cannot discuss here, the special leanings which appear in some children. Mozart's early musical brilliance is itself a problem. But the average child is usually led towards certain subjects by dominating or attractive elders. Casual remarks by such heroes may have the deepest and most lasting effects upon him. A father who says in his son's presence, "I was never any good, either, at arithmetic," may unconsciously prevent the son from trying hard to eradicate what now must seem to be an obvious hereditary defect. On the other hand, a child's knowledge that his ancestors were usually accomplished musicians, writers or

doctors, may cause him from the first to regard success as not outside his grasp. All this is of double importance. For it may explain the waning of interest as well as its growth.

Some subjects about which, when at school, you were much more enthusiastic than now, may have been taught by a dominating or attractive person whom you have now left. And sudden increase of interest in a (to you) "dull" subject may be due to your meeting at the university a stimulating teacher instead of a prosy one. To all this there hangs a moral. Grow out of the practice of working to please the teacher. This was a natural motive when you were little children. It is natural now, but insufficient. For teachers come and go, but knowledge and the thirst for it stay and increase.

Lack of interest due to wrong beginnings

Lack of interest is often due to ideas wrongly or incompletely formed in early lessons. Afterwards, nothing can be rightly, completely or easily grasped. Persons who, having been well-grounded in mathematics or electricity, are thereby enabled to take interest in abstruse problems and to persevere against difficulties, are to be envied. Sometimes the best cure for lack of interest in a subject is to rebuild its foundations. For obvious

reasons, do this, if it is necessary, before you have got very far.

In order to develop interest in a subject, actively secure information about it yourself. When you are in a library, find the shelves allotted to that subject. Get an idea of the outstanding books upon it, when they were written, who wrote them and what they deal with. Get the knack of glancing down the page for the author's name and his pretensions, if any. Be sure to notice the book's date of publication. The publisher is usually (not always) honest enough to print it. Text-books, for reasons easy to understand, are not always dated. To an expert, they date themselves, but not, unfortunately, to the beginner. Your interest will probably be greater if you find a book on the subject by someone you know, of whom you have heard, or whom you can "place."

If you can, talk about the new subject to people who know more than you. Do not seek opportunities to talk about it with people who know less than you. They will almost certainly blunt your own knowledge. They may discourage you by implying that only "brainy" people can understand the subject, and it is therefore useless, presumptuous and "bad form" for them, or you, to cherish ambitions towards it. Or—nearly as bad—they may unconsciously encourage you to

show off, to overstate your knowledge in a laudable desire to share it with them, and soon to cheapen the whole study. There are examiners who never willingly set a question upon the special problems in which, for the moment, they are personally interested. A hundred mis-statements of any theme would seriously try their powers of resistance.

It is only fair to warn you that—perhaps especially in England—workers in science increasingly object to popularise it. For this there are good and bad reasons. Yet, when you have spent a fruitless half-hour in trying to understand a few pages, it is worth while to reflect that while the fault is probably yours, it may be the writer's.

When you have obtained your knowledge, do something with it. Try to use most things you learn. This will have two good results. You will soon doubt if knowledge is ever useless. And your knowledge may be transformed into skill.

Do not delay the beginning of a study period. Get down to it ! Start with a vigorous initiative. Do something active, and of the type which you aim at doing during the period. If you are planning a paper, write something in the first minute. You may not use, eventually, what you have written, but go through the motions actively as a cricketer " gets his eye in."

Before you begin, know definitely how much you expect to do in the time allotted, and how you will set about it. If you read a book in order to make written notes, be perfectly clear in your intention. If you are reading it to get the author's point of view about facts which you know, you may give yourself the luxury of an armchair. Sloping book-rests which lie across the arms of a Morris chair allow hours of such reading without fatigue. But be physically alert. Unless your keen interest is assured before you sit down in the armchair, keep out of it. Do not mistake boredom for fatigue. Often when you think you are tired you are merely bored. The remedy may be a change in your learning methods. It is sometimes tiring to read a book for a long time, so occasionally making notes may be a remedy for your boredom.

Many people while young form the habit of giving up when they meet a difficulty in study. They would be ashamed to do this in sport. Try to transfer to your study some of the sentiments which would influence you during a difficult climb or walk. We shall say more about this "transfer" in Chapter XII.

Now and then you will require a rest. Rest intelligently. If, at some sacrifice, you have put aside four hours on a certain morning, in order

to write, don't spend your ten minutes' rest in reading an exciting book on another subject. If you do, you may find on returning to your writing that it seems hardly worth while. If possible, make your rest complete ; think of nothing. The work will look after itself.

Never, if you can help it, stop on a "dead centre." Leave your work at an interesting point.¹ Jot down some notes on your memorandum pad, so that you can begin again with no cause, or excuse, for delay.

¹ To this there is one important exception. If you are a bad sleeper don't do this just before going to bed.

CHAPTER VI

HOW TO FORM HABITS OF STUDY

THE earlier chapters may have laid stress upon the defects rather than the advantages of human habits. We must now redress the balance.

It is true that many modern writers are concerned with the shortcomings of habits. This is because the social world has changed so much in the last hundred years that man has had to hurry up to keep pace with it. The use of steam and electricity has changed our lives entirely. Even in our lives the petrol-engine has altered our habits. Yet many of our educators, often with laudable intentions, try to prepare us for a world which no longer exists.

Let us see why it is useful to form really strict habits of study.

You who play games know the advantage of having your own rackets, your own sports clothes, and of playing on the home-ground. You—or your parents—recognise the value of sleep-habits,

of going to bed at the same time each night. A few of you find it difficult to get to sleep in a strange bed or at an unusual hour. All this is because we are apt to form special responses to special situations. Señorita D'Alvarez tells how once at a tennis tournament she played so badly that a friend would not believe it was her fault. Measuring the court, he found that it was too short. Habit again !

Few young people, however, realise that study can be greatly helped by time-habits and place-habits, and by working in a predictable manner. The effects of such habits are the usual ones. We save mental energy. We have not to make unnecessary journeys and decisions. Most important of all, when habits are established, to study in a certain place at a certain time seems as natural as to fall asleep when one is in the usual bed at the usual hour.

First of all, let us consider place-habits. If you can afford it, reserve a desk in a corner of the house for study alone. Don't read novels or write sociable letters at it. If you can, work in that place at the same hours. After a while, like a dog who lies down contentedly in his corner, you will placidly work as soon as you sit down. There is nothing else to do ! The desk does not, as other articles of furniture may, suggest meals or

relaxations, so your attention is not distracted by thoughts of "might-have-beens."

If I may be allowed to remind you of a golden rule before you begin to work, remove all distracting objects from your field of view. Clear the decks if you possibly can; do this the night before, so that this tidying-up does not blunt your interest. It *will* do this if (a) you loathe tidying-up, (b) you love it. Since (b) is usually a virtue, remember that it is not a virtue here and now. You went to that desk for mental work, not for indulgence in housewifery. So have pencils sharpened, pens filled, paper, pads (good ones, if you can afford them), and rulers ready to your hand. That journey upstairs to get a knife will mean that you will see a friend, glance at the paper, and lose the "swing" that you had in your difficult work.

Before you begin, settle definitely (1) how much you intend to do, (2) how you are going to set about it. Don't merely resolve to read your book until the world has made one twenty-fourth of a revolution round its axis, then to make a mark in it and endure another book for a similar period.

• If you were playing in a football match, you would object to shiver on the touch-line for ten minutes before the kick-off. Adopt the same attitude towards work. Never delay your start.

I have suggested that, when the time comes, a rest in an armchair, with no distraction, is excellent. Why not a short burst of exercise in the open air? At the risk of being unpopular, I doubt the wisdom of this, if you want to return to work as keen as when you left it. It is assumed, of course, that the air in which you have been studying is fresh; why not? But intense physical and mental exercise have so little in common that they probably put your body into antagonistic "sets." One good thing at a time. But more work upon this important question is needed.

Ought one to study in privacy and quiet, or get used to distraction? This question is difficult to answer. Some possessors of many virtues believe that you ought to harden yourself toward distraction just as you harden your body by strenuous exercise. But their own lives often suggest that they have studied in this way; that they have gladly accepted whatever was written in their text-books, never questioning, never digging down to the fundamentals of anything. Theirs was just the kind of schoolboy learning which is possible against distraction. After your school-days it has serious limitations.

In these chapters we shall not discuss the desirable conditions for creating new matter, writing an original essay or book. Few who

have done these desire distraction, to harden themselves ! But—this apart—one can distinguish between studying merely to learn, *e.g.*, an irregular verb, and studying with the intention of understanding. The latter task, if difficult, is made impossible by some kinds of distraction.

There are, of course, distractions *and* distractions. It has been shown experimentally that the effect of a distraction depends upon whether it is like or unlike the work. If it resembles the work it is often a very potent distraction. I once tried to answer a dullish examination paper on physics while ten feet away, in a crystal-clear voice, an incomplete invigilator discussed exciting theories of thunderstorms.

Usually, and for obvious reasons, conversation of any kind is a distraction. But what of a noise quite unrelated to one's work ? A man, accustomed to writing dramatic criticisms in a newspaper office after the play, has written somewhere that when he retires, he thinks of having a small engine installed in the basement. It must hum constantly and vibrate the house very slightly. The house must smell slightly of oil. He will hire a small boy with a commanding manner to look in every fifteen minutes to see if he has finished his article. Otherwise, he fears the quiet country will distract him.

It may be that the *relation* of our work-activity to its unclear "background," of noise, colour, smell, warmth, etc., is more important than *absence* of background. Perhaps any constant and uninteresting background is better than one which, though neutral, threatens to change at any moment. A quiet, deserted house, in which, however, door-bells and telephones are likely to ring and to need attention, may be very distracting.

This suggests one aspect of the answer to an interesting problem: the possibility of working in a long-distance train. Some declare that they never can, or could. Others have had to answer this question without waiting for theory. The matter seems to reduce itself to one of constant background. A good train makes a constant noise. If it is a long-distance one, you know you will not be bothered much by officials. And unless your fellow-passengers are garrulous, a few hours of such privacy are a privilege.

Should one, if occasion offers, study in complete privacy? Yes, often. The finer points of any good book are best tasted alone, and original work is seldom done in a roomful of people.

There is another reason for getting used to private study. School lessons, and "preparation" in a boarding school, are usually social. They

may cause you to regard all lessons and all study as a sociable affair. So that studying when others are not there would seem unnatural, rather like dancing with yourself. After school life this attitude may become a real handicap. It is one which I have not found easy to overcome. On a wet Saturday afternoon, there are often many reasons why it would be wise for me to work, *e.g.*, that I may thus free myself for another half-day when it is fine. But the experience of school-days, when on such afternoons we either played games or lounged aimlessly, makes it difficult to settle down to work if I know that it is Saturday afternoon, unless others in the building are doing the same. This is an absurd, discreditable, childish weakness. Take warning in time !

There is no doubt, of course, that the stimulation of a team is valuable, and that the sight of other people working is such a stimulus. But (*a*) this seems to apply rather to laboratory and manipulative work, (*b*) it may produce the idea that unless one's "herd" is working at the same time, it "isn't fair."

- Lastly, a few hints concerning these learning habits.

Be careful *what* you learn. Perhaps you need not learn it. Ask someone who knows. At any rate, dismiss the belief that there is anything

virtuous in memorising a page of a book. Examiners, for their own purposes, may have to be sure that you know certain facts. But do not learn all kinds of foolish things because they may "come in some time." Learn only things that are worth the labour.

Go slowly in making the first impression, and be sure that it is right. Note very carefully the first movements of speech, writing, or adjustment, which you make in response to the new impressions or ideas. If you can, get these movements right the first time, whether they underlie the swing of a bat or the sound of a French word. If you cannot do this, insist on understanding where you were wrong, and correct your mistake at once. Remember that many mistakes need never be made. Doing the right thing is usually quite as amusing, and more useful.

If possible, learn the beginnings (but learn them properly) of many things when you are quite young. If you are not quite young, before muttering gloomy platitudes about stiff muscles, rusty sinews, and old dogs, ask yourself why you personally object to trying new things. There are many possible reasons. You may already have learnt something apparently like the new activity. Yet this older ability may now interfere because it requires some of the same muscles to

be used in a different way, *e.g.*, learning to waltz on ice, if you are a good ball-room dancer. If you do the apparently similar thing well, your conceit may make it difficult for you to adopt the learning-attitude towards your teacher. It may make you afraid of appearing foolish, an attitude which is wrongly called modesty.

Before launching yourself in the formation of a new habit, assert your will. Begin emphatically, even ceremonially. For such breakaways there is nothing like the beginning of a new term. During the holiday the power of places, furniture and times of day, to suggest the bad habits has probably been weakened by the lapse of time.

Once you have entered upon your new path, never allow an exception to occur. As Professor William James says, this is like letting drop a ball of string when you have wound it up ; the one false step costs you many good ones.

Seize every chance to translate your good resolution into action. When some tangible result comes from your good habit, do not think it self-righteous to feel pleased ; even to dwell a little upon the pleasure, and to trace it back to its cause. A business man occasionally views his profits with pleasure ; why should not you ?

Perhaps you will allow a personal example.

After years of muddling, I installed a filing system in my office. About a day after it had begun to work smoothly an Australian caller said, "You won't remember me, but a year or so ago I wrote to you." I swung round in my chair and spectacularly extracted the letter from the appropriate file. I did not tell my visitor how recent all this was. But I enjoyed my glow of pleasure.

I will not spoil for you the reading of William James's superlative sermon on habit, in his *Principles of Psychology*. From it come the two exhortations we have just discussed.

What are the advantages of habit? It helps an individual to be consistent. Habit, says James, is the "flywheel of society." It carries us just over the dead-centres in the day. It helps us to do irksome and unpleasant jobs. It enables us to do vitally important things, *e.g.*, driving on the proper side of the road, without making up our mind every time. This saves untold mental energy. It allows our friends and colleagues to predict, up to a point, what we shall do in any particular situation. This saves *their* energy.

Habit, too, increases accuracy. The actions demand little attention, so that we can concentrate upon our aim.

A stock of desirable habits makes life easier and guards one more surely against temptation.

This is the strongest argument against the view that we should have as few habits as possible. A weighty and momentous deliberation would then be required for every complicated action. We are not built to stand the strain.

CHAPTER VII

THE ECONOMY OF MEMORY

So far, you have been offered hints concerning the best ways of studying. Many of these suggestions are based upon experience and experiment, which cannot be described in detail here. The "economy of memory" is an aim which has stimulated experiments for the last forty years, in many countries. Their goal is to save labour in "learning by heart."

Study, of course, is much more than this. I am writing in front of an excellent reproduction of a Rembrandt. I wish I knew more about Rembrandt. But if this wish stimulates me to study him, I shall not begin by learning many words about him by heart !

Psychology is a good example of a subject which offers pitfalls and disappointments to the student who thinks that study is learning by heart. It is necessary to grasp the points, to understand the examples, to invent one's own, to test the assertions. But, except for definitions, there is

little except classifications that you could memorise. Even these are better understood by continually using them.

Study, therefore, means understanding, relating, judging, criticising, extending, as well as memorising. Some things, of course, must be memorised. A medical student must learn certain things by heart. He must know, for example, the position of the bodily organs, and the composition of prescriptions. In history and geography, too, much must be acquired in this simple way. Do not, therefore, interpret me as suggesting that you should look down upon learning by heart, but rather that you should look up a little to these other performances.

Let us, therefore, consider the economy of learning. Such may be the saving of time or of energy. These aims may require different methods. In the English Lake District there is a famous guides' race. They run straight up and down a small mountain. But even guides don't choose this path except when racing. It economises time but not energy.

- Usually, however, in memorising, economy of time brings economy of energy. For when you learn in haphazard ways, your tiredness often comes from doing unnecessary things.

The Processes of Memory

In order for an act of memory to take place, there must occur, *impression*, *retention* and *recall*. This may be simply illustrated by an analogy.

In one sense, a gramophone may be regarded as remembering a tune at the wish of its owner. For this, there must have been impression of the air-waves, set up by the original music, on the wax record. Next, this wax must have retained the characteristic hills and valleys ploughed in the furrow by the recording needle. Finally, a needle attached to a good reproducing soundbox, and of course the appropriate record, must be available when we wish to recall.

All this is like making a memory-record. There must be clear *impression*. Your eyes or ears must be directed and focussed on the material. Your brain, nervous system and body must be able to *retain* the changes impressed upon them when you learn. Until lately, people believed that experiences ploughed paths in the nervous system, or established new connections between different single spots in the brain. They ~~speak~~ speak less recklessly now.

You will hope to *recall* the fact when you wish. And if you are of the type which gets "stirred up" in examinations, you will know that this is not always possible. The bright idea strolls into your

mind just after you leave the examination hall. You seem, so to speak, to have mislaid the record which you wanted to play, possibly because of a bad filing-system, or the lack of one.

Can we improve our memories ?

In the last generation a change of opinion concerning memory seems to have taken place. At one time people thought that a brain's power to retain was great or small, and that there was nothing to be done about it. This belief is backed by little or no evidence. We know that our brain's power to retain may be diminished by drugs, disease or emotions, and that some very old people can recall remote but not recent events. So if the brain may be adversely affected in these ways, there seems little reason to suppose that its retentive powers are fixed.

Yet in practice, such a belief had an important effect. It suggested that even if our brain's power to *retain* could not be improved, methods of *impression* and *recall* could. So research has chiefly, and rightly, been directed along those lines.

Experimenting upon Memory

An experiment in science is, of course, an observation. But it is an observation of a special

kind. It is made in controlled conditions. Usually those conditions are as simple as possible. We can then isolate the factors which constitute them, vary them singly and thus measure their separate effects.

Experiments on memory can be made in this way. If you and I were set to learn a poem, you might beat me because you liked the subject-matter or knew the metre. If we had to give the gist of a page of psychology, after one reading, I might win. So one of the first things we must respect in experimenting upon memory is meaning. It should be constant for everyone, in theory, at least. Yet this is often impossible.

The situation, however, is not desperate. For the subject of experiment is not studying, but learning by heart. And you may know a thing in this way without knowing its meaning at all. In your speech mechanism you may form the habit, whenever you see or hear certain words, of making corresponding noisy speech-movements, without thinking of their meaning. My own speech-mechanism, for example, can utter "transpose, multiply by the coefficient of 'x' and ~~take the~~ square root." But I should not like to say, without warning, when or where I ought to perform these feats, still less if they would be successful.

At school you learned many things which, to you, had a minimum of meaning. Few young children, perhaps, know many reasons why the Normans invaded us in 1066. When you learn irregular verbs, there is no rhyme or reason in them. Both these subjects may have more meaning for you later, but that is not my present point. So the experiments which offer meaningless matter to the learner should interest you. They investigate speech-habits, and these are very important in the early years of education.

Don't fall into a trap, and regard all thinking as simply the use of speech-habits. The art of the chef has not disappeared since tinned foods became popular. And there is all the difference in the world between thinking out a problem for yourself and using other people's speech-habits.

Memory Experiments

Many experimenters have used nonsense syllables. You can construct them in this way. Take a vowel. Put one consonant before and another behind it. If it makes sense in any ~~language~~ known to you, reject it. Then ask a friend to throw out from your list all those which make sense for him. After such filtering there will be left syllables, "equally" difficult for all readers, equally long and "equally" meaningless.

Thus, like Euclid, you may say "any syllable is equal to any other syllable."¹

You can now arrange that only one syllable can be seen at one time, through a slit in a screen. Ingenious cog-wheels provide that when the "word" has appeared long enough to be read, it steals swiftly away, giving place to another. This is like reading from an ordinary page, except that your eyes move in jerks and the words remain still.

You must, of course, fix the rate at which the "subject" reads the syllables and the way in which they are read. If he begins by reading them aloud, so he must continue. The time of day should be kept constant. The number of repetitions required for a complete and accurate recall must be carefully noted. You can read about these refinements in Henry J. Watt's little book, *The Economy and Training of Memory*.

Ways of Recall

A student is usually required to recall knowledge in two ways, *immediate* and *delayed*. In a written examination, he may decide at the beginning that though he does not know the answer to question 6, he may do so in an hour. So he wisely attempts question 3, his *forte*. But

¹ This is, however, only approximately true. Cf. footnote to page 71.

in the "viva" and often in everyday life, some kind of answer, even if not the best possible one, is wanted at once. So experimenters must occasionally take into account the *readiness* of the response.

This is done electrically by measuring the time between the appearance of the syllable with which some "partner" has been learned and the reply of the subject. Speaking this reply breaks an electric contact, established when the falling shutter, exposing the syllable, started the electric clock.

These are very incomplete hints of the laboratory work during a generation. But I could not pass to its results without indicating its nature and mentioning books in which details can be found.¹

¹ Cf. P. Sandiford, *Educational Psychology*, pp. 207—251. London, 1928. The advanced student may be referred to F. C. Bartlett's discussion of these methods. "Experimental Method in Psychology." Presidential Address to Section J, British Association for the Advancement of Science. South Africa, 1929.

CHAPTER VIII

PRACTICAL AIDS FOR MEMORISING

THIS chapter will summarise conclusions, drawn from experiments, concerning economical memorising.

Learning in Parts and Wholes

First, should you learn a poem in verses, making sure of each before you proceed to the next, as a climber secures every foothold? Or should you read it as a whole, getting an idea of the wood before observing the individual trees? Will not the first method give you confidence? Will not the second muddle and discourage you?

The answers to these questions depend partly upon the material, partly upon you, your age, and your self-confidence. If the material is fairly short—say six verses—if it is easy to understand, if it is connected in meaning, especially if it has internal unity, use the “whole” method.

Read the poem straight through. At once try

to reproduce it. Probably you will remember only a little. But this effort at recall is useful.

Now read it as a whole again and again, trying, after each effort, to recall it. Usually, just as you think that the method is silly, and that you will never be able to recall the poem, it will suddenly come complete into your memory.

The really necessary thing here is confidence in yourself. It is like the self-trust which a swimmer needs when submerged for some seconds in a rough sea, after having been taught in a well-behaved pool. Not all of us naturally have this attitude. But it can be cultivated. Ask a doctor, lawyer or professional lecturer.

If, however, the matter is difficult and you don't understand its separate parts ; if they are not connected, so that there is no unity, if you can't see what the writer was intending to convey, then do not learn it as a whole, because, for you at least, it is not a whole.

Naturally, there are limits to the "whole" method. You would not use it for "The Faerie Queene." But even when the material is so long that the whole method is impracticable, you can profitably tackle bigger sections than you have been accustomed to learn.

Some reasons for this are illustrated in the

diagram on page 75. It represents learning in small and larger units. The dotted lines stand for three four-line verses. The continuous lines represent bonds of association made between the ends of the lines. Of these bonds :

C and F are necessary.

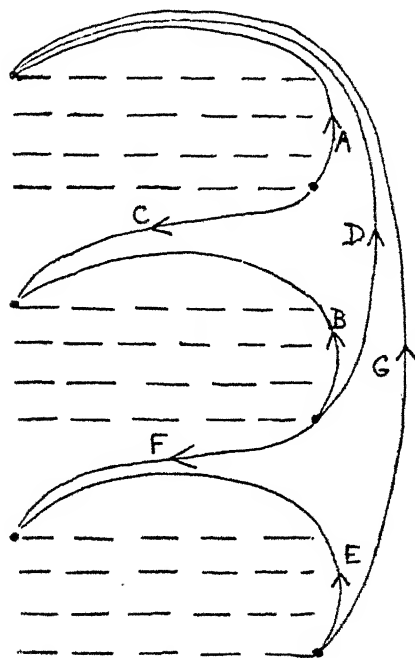
G is unnecessary, but unavoidable if the poem is read more than once, for an association is thus made between its end and its beginning.

A, B, D and E are not only unnecessary, but seriously obstruct learning. Take A as an example. It is a hindrance, if when you get to the end of the first line, you have a strong tendency to go back to the beginning of the first verse instead of the second.

One instance of this "whole" method of learning is convincing to many of us without the backing of experiment. When, at school, you acted in a play with a large cast, you learnt your own lines. But "on the day" did not most of you know all the others too? Certainly you had not heard them for a length of time equal to your own learning-time multiplied by the number of parts. You had learnt the play as a whole, with all the help that unitariness of meaning can give.

The "whole" method seems to have been unanimously found better when the habits concerned are verbal; like those in "learning by

heart." But where the learning is of other movements, *e.g.*, of hand, arm or leg, the findings of experimenters are not in accord, for reasons which are given in more advanced books.¹



Heaping and Spacing Repetitions

Another question of practical importance is, "Should repetitions be spaced out in time, or heaped up?" Suppose you wish to know a subject

¹ Cf. Sandiford, *op. cit.*, pp. 225 ff.

in 8 weeks, and that it would require 20 repetitions if you did nothing else until you had learnt it. You will then know it after fatigue and boredom, and thus you may be tempted actively to forget it.

Now suppose that you space your repetitions, say once a week. You will not require so many as 20. You will be less fatigued. There will be fewer chances to "hammer in" your mistakes by practising in a bored state. If, too, you have not "got rid" of the subject, but frequently return to it, other things, cropping up in the everyday run, will remind you of it. You will thus form associations between the subject and others; a very excellent thing in these days of specialism, when so many people work between high walls and never peep over them. Its memory will last longer. Decay of memory is never so effective when directed against a material learnt in distributed repetitions.

There are, however, qualifications to this advice. "Heap" your repetitions until you understand the matter. For unless and until it is understood it will certainly be forgotten.

Finally, never feel that you have got rid of a subject, that it is put behind you, like successive villages on a weary trudge. For it is really possible to put a thing out of your mind. Such

a forgetting is helped by the modern division of knowledge into "subjects." Often this custom is most misleading. Many, who come up from school to the universities, suffer badly from it.

I know a young woman, who, about the age of ten, announced that, having finished Science, she was going on to Art. A medical student once objected to studying a frog in his physiological course on the ground that he had "done the frog" in biology. These stories have a moral. I hope it is obvious.

Give the impression a chance

I would suggest to you that your study of interesting things is not a task, but an artistic experience. A friend, after delighting for several successive nights in a superb performance of Wagner's *Ring*, refused to go to the company's crowning performance, the *Mastersingers*. He wished, he said, to preserve a perfect memory untouched. At the time, I thought him foolish to throw away such a chance. I see his wisdom now.

So when you have finished a period of study, pause for a few minutes, not only for rest, but to let the lesson sink in. During that "rest" period—perhaps it is not rest which takes place—do

nothing active or exciting. For activity works harmfully in a backward direction, upon what you have learnt. While not strenuously thinking about what you have learnt, don't drive it from your mind by firmly directed thinking about other matters. Don't clog the impression by reading the morning paper, with its exciting news and its insistence that you shall do a cross-word puzzle, or fill up a coupon, or something equally urgent. Even physical exercise probably helps to drive the memories out of your mind.

Before you begin to study for any period, ask yourself, "How do I want to recall this?"

(a) in pictures or diagrams?

Those which appeared in the book, or mine, simplified, and marked with letters of my own choosing?

(b) in written words? Whose, the author's or my summary of them? Do I expect to reproduce them in easy circumstances, in a written examination, in the emotional strain of a viva or the hostility of a committee meeting?

(c) in spoken words? The author's or mine? If mine; with or without comments? Spoken to a friend, an opponent, a class, a small or large, visible or unseen audience? If I am to make a speech about it, what is to be its form? An ordinary speech, a lesson, a lecture, a talk,

“straight” or wirelessly, or a contribution to a debate?

Perhaps these distinctions may seem to you over-subtle. When you have suffered from ten years of speeches, you may revise your opinion. The techniques of these different forms of speaking are at least as different as those of real tennis, lawn-tennis, racquets, and badminton. These latter differences you are sure to regard as important!

I do not know how the custom, in some American schools, of asking children to describe a current event, works out in practice. But if at an early age our own schoolchildren could be encouraged to give an explanation of some simple matter without the usual furry deposit of “er, er,” “you see,” “you know,” “like,” “I mean,” it would help them and their hearers in later life. Time might even be spared from the hours devoted to cube root, calculations about men who pass each other on circular tracks, and the input into cisterns of competing pipes. And children might remember these lessons about speech.

“What things ought to be learnt by heart?” you may reasonably ask. You may be a little muddled by persons who talk and write as if the best people never did such things. “Provided you understand it,” say they. . . . But most

people agree that definitions, technical terms, some formulæ, some dates, some facts which do not depend upon logical connexions, *must* be learnt, unless (*a*) you can find the book which contains them when you want it, and (*b*) you have finished with examinations.

In learning by heart, it is better to read aloud than silently. Your voice will appeal to your auditory imagery, if you possess and use it. Moreover, you will thus ensure that you did not omit anything. It is better to read rapidly than slowly. One reason is because this lessens the risk that while learning you may think too deeply about what you are saying. This would merely distract your attention. The thinking should be done beforehand. Verbal habits are often most useful when their significance is not too deeply pondered. If as a young and nervous chairman you think too much about the words which in conducting a meeting you should use promptly and decisively, you will probably falter. Your verbal habits, "Is it your pleasure that I sign these minutes as correct?" "Will you kindly speak to the motion, and address the chair?" "As I hear no further discussion, I will put the question," will save your energy for the time when you must express yourself and not your functions.

You must, therefore, especially in your school

and undergraduate days, learn some things by heart. The process itself does you so little good, to put it very mildly, that you will desire to make it as brief and as effective as possible. So the following hints may be useful to you, though they do not pretend to finality.

Learn such information, if possible, from your own notebooks. For this there are many reasons. They are yours and you ought to be proud of them. You took the notes and wrote them up. These processes have helped to impress the facts on your memory.

If the words in the notebook are of your own choosing, you ought to feel sufficiently satisfied with them, to offer them to the world at any time, even in an examination.

Other books will tell you how to take, and to write up, notes of lectures, summaries of reading, and laboratory work. I may venture a few hints which seem adapted to the kind of work done by the students I know.

The advantages of the loose leaf system are many, *e.g.*, you need carry only one notebook. There is another, less obvious gain. The fixed-page notebook always offers you an excuse for not inserting important matter in the middle of a chapter. But loose-leaf books have other advantages. If you form the habit of taking notes only

upon your own type of loose-leaf, you will not have to struggle with notes taken on the backs of envelopes months ago, and now scrubby, unintelligible and half-forgotten. Such notes you always mean to write up, and don't.

Does anybody yet know whether, for memory purposes purely, it is better to write your notes legibly or to type them? I wish I knew. I can type quicker than I can write legibly. But I suspect that my written lecture-notes have a familiarity, a warmth and intimacy absent from notes typed even by myself. Perhaps the muscular process of writing is more closely welded with my behaviour. When I write an indignant sentence, my writing-behaviour is probably indignant. My typewriting is not automatic enough to serve as spontaneously expressive behaviour. Yet any writing would have to be *very* legible to allow a lecturer or a business man to glance over six pages in three minutes, just before they are wanted.

Handiness is, of course, one real value of a notebook. Therefore there cannot be anything about margins, spaces between lines and paragraphs, setting of subordinate sections, numerical and alphabetical headings and different kinds of print which it would not be useful for you to know. If you use visualisation at all, you will see a special

reason for this. You will tend to remember many things read in books by the position on the page of the headings and paragraphs, even perhaps by the type of print. The chief use of the eye is to distinguish between positions. You find it specially easy to do so in visual memory. Exploit it to your advantage.

Whether coloured inks in notebooks are ever worth the trouble I cannot say. Perhaps the answer depends upon the learner's interest in and imagery for colours. Yet excellent effects are given in monochrome by spacing and emphasis. There is no reason to suppose that Nature has gifted you with equal power to remember pictures and words. Maybe you are not very good at either. But if you are rather one-sided in your imagery, exploit your strong points. If you remember easily and correctly pictures, faces, maps, diagrams, sketches, use them freely. If you find it helpful to write main headings in large type, to set in the smaller headings in medium and the matter in small, go ahead ! For a public speaker this is an uncommonly handy way of remembering them. If you can see them in your mind's eye, you will be less disturbed by interruptions.

If you are a verbaliser ; if you remember, respect and delight in the exact words which some person has employed, use your gift. It will help

you in literature, law and history. In philosophy it will sometimes aid you : at other times it will be a millstone round your neck. Thousands have been prevented from thinking by remembering the stentorian utterances of Dr Johnson, and some Latin proverbs. Great verbalisers are seldom found among the creative scientists, for at every point they are forced to abandon old words and invent new ones.

On the other hand, for the sake of justice and elementary respect, you must be a stickler for accuracy when quoting a statement, whether it be of a philosopher or of your opponent in a committee. But do not be cowed by sonorous rumbling words ending in "ation." Most of them represent generalisations. A man must be an authority to be trusted when making them. Since they form the chief basis of after-lunch and political speeches, examine them carefully. Handle all "isms" with a pair of tongs.

Don't try to visualise definitions or laws. Learn them by heart, if you think you will need them.

If for any special reason you concentrate upon one book, just before an examination, it should be your notebook. If you visualise habitually, there is a special reason for this. The spatial relations of the paragraphs in the book will be

constant and will impress themselves on your visual memory. This advantage will be thrown away if you use several books.

How to read for the purposes of study

You will often read because you "feel like it." Upon this private joy I would not intrude. But you may also be studying, a process which may or may not be joyful. Then the following hints may save you time and energy. Many of them are paraphrases of Professor H. D. Kitson's valuable suggestions in his *How to Use your Mind*.¹

Before you sit down to study from a book, ask yourself :

What am I looking for ?

Is this the most likely writer to give me the information ?

What is he going to discuss ?

And afterwards :

✓ And did he ?

When you browse in a library, taking up a book to see if you will read it further, a few more hints may be helpful, before you decide to spend some hours upon it. Notice the title, and the sub-title, which sometimes indicates the field which the book professes to cover. Who is the author ? If the book is on a subject important for your

¹ New York.

purposes, try to discover his standing in the field of knowledge. You may find this described after his name. He may be in *Who's Who* or *Who's Who in Science*, if alive ; or in the usual books of reference, if not. Don't reject the book if you find his name in none of these.

It may be important—it will probably be interesting—to know his age, his school, college and (if any) university, and his right to pose (if he does) as an authority.

Glance at the preface ; if it looks encouraging, make its better acquaintance. Here he makes friendly advances to you, offering, maybe, an *apologia* for his book. He may frankly warn you about parts of it which he wishes were better. He may even say why he wrote the book at all.

Discover the date of publication. If you want to understand “inductance,” don't palter with a text-book of physics published in 1870, or even, perhaps, in 1920. And remember that few controversial (and thus jolly) matters get into text-books. By the time the swirling dust of the arena has settled about any subject it is probably at least five years old. A text-book takes, say, two years to write, and another year or two to get into your hands. Yet $5 + 2 + 2$ is nearly a decade !

Look at the table of contents. If you know the field fairly well, this glance may save you any

further trouble, for the book may be copying a host of other and better ones.

If a modern book, designed for purposes of study, on a serious matter, has no index, it is possibly not a very good book. If it has an index, use it intelligently. For example, when preparing for an examination, ensure that you know something about the various subjects to which the index points.

CHAPTER IX

PROGRESS IN LEARNING ; ASCENTS, PLATEAUX AND SLOUGHS OF DESPOND

UP to the present we have considered the best ways of attacking work and of becoming interested in it. We have assumed, perhaps, that progress would inevitably result. Let us now abandon that easy assumption and study the progress itself.

Suppose that you are caught in the rain at night, miles from home, and that you know the way. You put your head down and walk hard. But supposing, in a storm, you were trying to get home across unknown country and couldn't see where you were going. Your progress would be rapid if you struck a good road, slow across rough, unknown country, very slow in a bog, and irregularly slow if you climbed a slippery grass slope.

Learning is like that. Putting down your head and working blindly is foolish. Learning-progress is like cross-country running, where you can save yourself a great deal of trouble by using your eyes and your intelligence.

Practice in learning has been the subject of many experiments. Their results can be used practically. If we graph the results of learning against the time required (naturally there are different ways of choosing units and different types of work) we shall obtain a curve¹ which usually shows the following features :

(1) Great irregularity. This always occurs in complicated learning and must not depress you.

(2) Very rapid initial progress. The ascent of the curve is at first very steep. This is extremely common in some kinds of learning. There are many reasons for it, as, for example, that the easiest things are often offered first by the teacher. In learning a language one is often introduced first to words of one syllable. These are easily remembered. Again, early progress occurs in many different directions. You soon learn nouns, adjectives, days of the week, colours ; a vast number of new things. Later on, the number of new things is much smaller, and improvement cannot be so rapid.

Interest, too, is greater at first, when the work is novel and easy, and you are generally excited by it. Again, you are undaunted by the thought of difficulties ahead. Many beginners are not

¹ For different types of curve and reasons for them see the writer's *Skill in Work and Play*, Chapter III (London, 1924).

troubled by imagined obstacles. Later, if you are shy, suffer from a sense of inferiority, or even if you have fair critical powers, you may anticipate real difficulties which would never enter the heads of the phlegmatic, reckless or stupid.

Do not infer from this that one always does well at the beginning of things. It depends partly on the work, for there are a few exceptions to the general rule. One is exemplified by mirror-drawing, that interesting parlour game which can be converted into a scientific exercise. If you are told to pencil the outlines of a geometrical star, drawn on paper, as quickly and as accurately as possible, while seeing your hand in a mirror, you will begin badly. Afterwards you will improve rapidly until you can draw it almost as well in a mirror as directly. This is because in mirror-drawing you unlearn some habits, while usually, in learning lessons you do not unlearn habits, but simply add new ones.

The learning curve generally shows that after the first spurt, the rate of progress is slower. At some point, the learner is not climbing, but is on a flat plain or plateau. Progress seems to have ceased.

This phase is common in learning. It has been called the "Slough of Despond." Many describe it as a phase when they feel that they can learn no

more. They may feel bored, stupid, helpless or satiated. New ideas cannot be grasped; even old ones seem to slip away. At this point many people abandon lessons in music, French or sports for the rest of their lives. They imagine they have reached their limit.

It is more likely that they are on a plateau—possibly their first. For plateaux occur again and again in practice-curves. Let us try to understand some of the characteristics of plateaux, and their nature.

They may be long or short. For growing children at school there may be a whole year during which little progress seems to be made. Plateaux lasting a month or more may occur in a single term.

Concerning their causes, several interesting theories have been put forward. First, a plateau is often the prelude to a rapid rise in efficiency. It may be a warning of further progress. This may seem strange until we realise that when we begin to learn anything we are apt to learn it in bits. Even modern teachers of foreign languages do not offer at first complicated sentences, with their special accents and intonations. In the case of a language, after a while we arrive at a saturation point for common simple words, yet all the time we have been learning to use these words in

sentences and phrases. The plateau may represent the period during which we are integrating these units into bigger ones.

In learning a dance you can soon make all the separate movements quite well, but when you try to put them together all kinds of difficulties may arise. It may be long before you get those large new units perfect.

A common cause of the plateau is flagging interest, leading to less effort. Then it may be wise to give up for a time. A way out, which is scarcely possible at school, and not always easy elsewhere, is to change your teacher. You may have been taught—well or ill—by a method which has now lost its usefulness. Transferring to another teacher may introduce you to a new method, and new interests both personal and impersonal. This seems very true of learning games. Every teacher has his own way of imparting knowledge and creating enthusiasm. When “saturation point” with one way is reached another’s new methods may suddenly become useful.

A plateau is sometimes caused because the learner has grown accustomed to being afraid to do his best in the presence of the teacher or certain other pupils. If he has been taught in a group, he may have got used to believing that he will always be the worst. His teacher may be too

spectacularly efficient and convince him only of his own clumsiness. To give up the subject for a little while may, later on, bring him into contact with other teachers or other companions who do not produce this effect upon him.

A most effective producer of plateaux is satisfaction with one's own performance, arising from ignorance of the heights which are possible. Another reason for the plateau may be lack of self-confidence. This may be due to the method of teaching. Good pupils often lack the assurance which a different method or a different teacher would give them.

A plateau is often the result of hasty early learning; of speeding-up before there is a secure foundation. Difficulties arise because one has not grasped the right things at the beginning. The obvious remedy is to reconstruct one's foundation.

The right attitude towards a plateau is to resolve to make it as short as possible. A rest may be good. But if the plateau is due to boredom merely because the subject has become harder, the cure is more effort, and change in methods of study, perhaps in your methods of taking notes, or the hour of day. A talk with an expert who is perennially interested in the subject and understands your attitude may be incalculably valuable.

CHAPTER X

INTELLIGENCE AND STUPIDITY

IN these chapters it has been insisted, perhaps *ad nauseam*, that in studying, your hard work should be applied in directions which will bring you profit or pleasure. You must decide where, when and how to work. In other words, you must study intelligently and not stupidly.

Recently a number of psychologists have tried hard to discover what we ought to mean when we say that a person is intelligent. There is among us a convention that we seldom talk of a person's intelligence as an asset, though beauty, grace, good manners are openly recognised. Perhaps kind-hearted people refrain from saying much about intelligence because this might focus attention upon its opposite, stupidity. An American professor writes that of many students who have offered him excuses for failure, only one has said "I guess I'm too thick." Yet there can be no doubt that the intelligence of people in the same section of society—often in posts of the

same financial and social standing—differs surprisingly.

It has been acutely observed that, while people's opinions may differ concerning the nature of intelligence, they are apt to agree about the people who are intelligent. What *is* intelligence? is a more difficult question than "What does intelligence *do*?"

Let us take a few examples of behaviour and lead up to our point.

Some would say that a dog acts intelligently if he fetches your stick when you are going out for a walk. This is a simple connection of a special kind of behaviour with a special kind of situation. The act is pleasing to you, but not very intelligent. If by, say, the age of four, which we will suppose for the moment to be the dog's age, a child had learnt no more complex actions than that, we should say it was very unintelligent.

Some people believe (we all should like to) that horses are intelligent. Others say that if they were they would kick the bottom out of the cart when you try to break them in. Dogs and horses are dependent upon habit to a much greater extent than are human beings. And habits are often opposed to intelligent action. The term intelligence should be reserved for something higher

than the capacity to form habits, useful though this is.

You may say "I know intelligence when I see it in action just as I know physical beauty when I see it. Can science discover what either of them really is?" The answer is that though scientific investigators cannot discover everything which constitutes physical beauty or intelligence, they can find out much. If a number of persons agree that a certain man is beautifully proportioned, the anatomist can measure many lengths of body and limbs, relate them to average measures taken from similar people, compare them with different ratios, characterising bodies which other nations call beautiful, and so contribute to our general idea of bodily beauty. Similarly, by comparing the performances of persons of different intelligence, we can ascertain what intelligence does.

What is it that intelligence does? An intelligent person is reasonably described as one who can fit himself effectively into a new situation. If you like to put it this way, he can solve a new problem. But many of you may still think of problems as necessarily existing in books, or even in examination questions. Stating a problem, *i.e.*, formulating the essentials in a situation and arranging them in workmanlike order, is often harder than solving it. Unintelligent people

often find great difficulty in stating their problems.

Note that the situation is "new" *for the individual*. Events happen every day which would be new to you or me, but not, of course, new to everyone.

Let us now imagine a new situation, demanding intelligent action. You live in the remote country. You find yourself in London some afternoon, with half an hour to catch your last train from a station three miles away. What must you do?

Take a taxi? If its route intersects some crowded crossings you may be held up several times and lose your train, not because the taxi is naturally slow but because it is not allowed to move fast.

Go by Underground? It will travel fast and is seldom held up. But you will take time to buy your ticket, reach the lift, walk from it to the right platform, alight from the train, find the lift and get up to street-level. Even then you will not be at your main-line station, but at the nearest Underground Station, which is often some distance away.

Another possible way would be to take the Underground through the most crowded part, and a taxi from the Underground exit to the main station.

Now if this is an intelligent solution (and we will suppose it to be so), what are its characteristic features? First, you did not behave towards the situation as if it were a simple one. You broke it up and saw that there were two problems; offered by the crowded and the less crowded parts of the city. "Underground" and taxi give you the best of both worlds. Mere habit would probably prompt you to take the Underground and walk at the other end, or to take a taxi in both instances. Anyone can form a habit of travelling in some specific way. It is the capacity to decide when certain habits are useful, and when not, which distinguishes the intelligent person.

Breaking up the situation is not enough. You must piece together the bits which result, and make a new pattern. You must not only see the difficulties in the traffic problem, but how to overcome them separately. You must grasp *relations*; of similarity and of difference; of longer and shorter, in space and time. In London, the shortest way in space may be a long way in time. Both the taxi and the underground are means of travelling quickly. But the taxi encounters many more obstacles. The two means of transit present relations of similarity and difference. It may take much time to get into and out of an underground train, while in a busy London street

it may take no time to get into and out of a taxi—a relation of difference. The “Tube” lands you some distance from the booking office, the taxi a few feet away. It is usually easy to get a porter if you arrive in a taxi. If you travel the greater part of the way in the cheap train, you leave the shorter distance for the expensive taxi.

In all the above there is a comparison between differences, of time and money.

We do not say that when an intelligent person behaves in this way he *necessarily* sits down and sees all these consequences. But we do mean that he once saw them. He may have formed the habit of taking a taxi for short distances and the Tube for long ones. But even that had to be learnt, and sometimes has judiciously to be broken ; e.g., if he had to address an important meeting at short notice, the long, secluded taxi-ride beforehand might justify itself.

This capacity to see relationships of space, time, similarity, difference, cause and effect, differs greatly in different persons. Some people easily see resemblances, others remark the slightest shade of difference between things. In the first class are many inventors and poets, also mere cranks and punsters ; in the second, critics, judges, likewise mere grumblers.

The fact must be accepted that people differ

greatly in intelligence ; more than is generally supposed. The less intelligent people can be helped by their teachers to apply methods invented by the more intelligent. The very intelligent person breaks up his problems without much help, yet the less intelligent one can learn at school how to analyse many classes of problem.

I can only point to opinions, some of them rather disturbing, which many psychologists hold concerning intelligence. One is that it is inborn ; another that it does not increase after the age of sixteen. I could not give you here any idea of the vast amount of evidence in support of these beliefs, or of an alternative one, that there is a kind of intelligence which has not yet been detected by their tests. But lest some readers over sixteen may abandon hope, I hasten to add that after that age we may amass an enormous number of *acquired* (as distinct from inborn) advantages. We may acquire habits of body and of mind, better manners (which often become chiefly habits of body and mind), views on life, knowledge, techniques in work and play, a bank-balance, an automobile ; influential friends ; in fact the number of useful substitutes for intelligence which can be so added by fortunate people is large. Very high intelligence may be a drawback in some social circles (this is meant very seriously).

Now, a person who does not behave intelligently towards a given situation is likely to be called stupid by people who do, or could. Many people are accused of stupidity because they have not seen certain relationships. I hope I shall not create too many enemies if I flatly say that in mathematics classes, more often than in others, pupils are thought stupid by their teachers. In algebra and geometry one has to see relationships and act upon them quickly. But these are relationships of a special kind. A brilliant wit owes much to the ability to see unusual relationships. Some mathematicians have been brilliant wits. But not all.

It is likely that if there are special kinds of intelligence there are special kinds of stupidity. It has often been held, and quite rightly in my opinion, that to make mathematical ability a *sine qua non* of entrance to a University would rule out many people who are stupid mathematically, but not otherwise. I would even suggest that most intelligent people may be stupid in certain situations. But one must honestly record the suspicion that some of them could see the relationships in the situation if they really wanted to. One has heard of bookish men who are not clever with their hands, and are too stupid to be entrusted with such jobs as mending the bathroom tap.

Perhaps they really cannot see the relationships in bathroom taps ; perhaps they are too intelligent to want to see them. But that reminds one of the feeble-minded youth who used to wheel his barrow upside down. . . .

Yet it suggests that there may be at least two co-equal classes of stupidity. The first is not *knowing* in the right way ; the second, not *feeling* in the right way. Some stupid people cannot sympathise with a problem, or activity ; cannot see why it is supposed to be important or interesting, or why other people should make such a fuss about trifles. Artists and musicians can be very blind and deaf to things which less temperamental people think to be important. Perhaps their knife-edge sensitivity to some matters necessitates being " tuned out " towards others.

A person who fails in learning may be stupid in either or both of these ways. Any attempt to discover cures for stupidity may be helped by these distinctions. After you have read Chapters XI and XII you will see more clearly how both these kinds of stupidity may be lessened in most people.

CHAPTER XI

WHAT IS A GOOD MEMORY ?

THIS chapter's title is a challenge to thought. For, maybe, we cannot usefully talk about *a* good memory. Smith seems to remember many things of different kinds, while Jones seems to forget most things. But generally we make this judgment about Smith because we are interested in the things which he remembers and those which Jones forgets. The absent-minded professor of legend forgot many things, but he would not have been made a professor if he had not remembered a fair number of others. He may, too, have been intelligent enough to be absent-minded, and thereby excused from many unpleasant duties. Some of his successors wish they had had the foresight to create this impression.

When we say that Jones has a bad memory we may be quite ignorant that he remembers a number of things unconnected with our own interests, so probably it is about as useless to say that a person has a good memory as to say (if you are

speaking to a physiologist) that he has a good body. The physiologist thinks of the body as a collection of bones, muscles, nerves, organs, blood vessels, and the rest. Most bodies, even if good on the whole, have special excellences and defects. So, in the case of either good bodies or minds, one might ask "good for what?"

This is the point, of course. We can say that a person has a good memory for faces, numbers, or music. But let us consider the conditions of such goodness.

First, that the power of impression is good; that shortly after an event, a person may have a vivid, detailed and accurately recalled experience of it. But we must then ask ourselves "What event?" Did it appeal chiefly to the eyes, the ears, the nose, or the muscles? A man who may vividly remember a fancy-dress ball might have a very bad memory of a new symphony.

Moreover, the power of remembering well is not necessarily connected with that of describing well, and to remember an event soon after its occurrence may or may not accompany a well-marked ability to retain it for months or years. Even then, much depends upon the way in which recall was demanded. Some people who do well when allowed to volunteer their own statement, fail badly under a cross-examination which

may contain distracting or even misleading questions.

• It is useful to have a high degree of assurance concerning the memories which one recalls ; provided that they are true. People who live by their memories, such as lawyers, lecturers and medical men, probably develop a special degree of such confidence.

A useful memory often implies the power of prompt recall. In experiments it is found that, other things being equal, the person who can recall facts promptly retains them for a long time.

It is more doubtful if among the essentials of a good memory may be included the capacity for *rapid* learning. A popular belief is that the more rapidly you learn, the quicker you forget. But this is possibly dictated by the wish that natural defects shall be naturally compensated. Experiment suggests that if there be any connection between rapid learning and permanent retention, it is positive and direct. This could be explained on the reasonable supposition that those talents which help a person to learn quickly also help him to recall easily.

It would be interesting to examine the view that a good memory should be full and detailed. The possession of detailed memories may hamper their application to one's present problem. A

doctor who recalls too vividly exactly what his old teacher said, forty years ago, may have recalled too much for his present purpose, the application of some recent medical discovery to an urgent case. Often what he needs is but the barest sketch or hint of the older memory.

A good memory should be exact. It should be spoiled by as few omissions and additions as possible.

We said that a memory should not be too detailed. Clearly some details must be left out, but which? Those which are irrelevant to the problem in hand. But when we enquire into the nature of the powers which prevent irrelevant details from entering consciousness, admitting only the relevant ones, we are on the brink of vast problems. For while in the commonplace mind most things that have happened in connection with others seem to be relevant to these others, to the genius everything is ruthlessly excluded from consciousness except the idea which matters at the time. And this idea, to anyone else, might seem irrelevant.

Easy recall characterises most good memories. How this facility arises is difficult to say. When the memories are muscular habits, as in games or in pronouncing words, the ease may be just that which accompanies all habits. Yet this would

not explain the ease with which some persons remember landscapes, faces, colours, outlines, shapes and seen movement.

All this illustrates the remark of a French writer, "Memories are everywhere, *the* memory is nowhere." It leads us to the subject of the next chapter.

CHAPTER XII

CAN "THE MEMORY" BE TRAINED?

THROUGHOUT this book I have urged that studying hard is not enough. You must know where and when to put in hard work, and to use your energy only where it will tell. A belief, simple and misleading, which may cause you to waste much energy, is that if you work hard at anything in order to remember it, you will thereby strengthen or train "the" memory. The learning of irregular Latin verbs and the playing of cards have been defended on the ground that though the learners will never know much about Latin or bridge, they are training their memory. It has even been said that if you can remember which cards are out, and if you play bridge often, you will develop a good memory which will help you in mathematics. This is based upon a false belief, and there is much experimental evidence to disprove it.

The belief is that you have a unitary memory, as you have a single right arm. You have no such thing, but many different powers for remem-

bering different things. Even the "images" with which those powers work are of different kinds. They are of shapes, colours, words, numbers, faces, names, movements, sounds, smells. If you are good at recalling one kind you need not necessarily be good at another, just as if you have curly hair, you do not consequently possess expressive eyes, a straight nose, a clear skin and a slim and graceful body. Naturally we remember those lucky people who have all these beauties at once. But most persons have only one or two.

To say that a person has a good memory generally means that he can remember many things of a certain kind (for instance cotton-prices, dates, or faces), or that his powers for several different types of memory ("seeing" faces, "hearing" sounds, "feeling" muscular movement) are well developed.

Let us try to summarise what is known about this matter.

- (1) We have special memories for special things.
- (2) We can train those special memories for special things.
- (3) Only in a few limited ways can we train a special memory-power so that the effect of the training is transferred to other memory-powers.

These assertions do not deny that your memories may have been improved in different directions by the work you have done at school. They deny that practising one subject *necessarily* improved your powers of remembering quite different ones, or other parts of the same subject. It may do so and it may not. Generally speaking, the amount of "transfer" of improvement from one subject to another is small.

It is impossible to give you here details of the many experiments on the transfer of memory which have been carried out during the last thirty years. The best easily available account is in Professor Peter Sandiford's *Educational Psychology*.¹

Such experiments show that if you wish to improve considerably in memorising one subject you had better practise that subject, and nothing else. Yet, for *some* learners, in conditions which have been studied, *some* "transfer" of training, from *some* subjects to *some* others does occur. Such transfer may be *positive*: transfer which helps, as when practice in estimating light weights improves the judgment of heavier weights; or *negative*: transfer which hinders, as when a

¹ London, 1928. See also *British Association Reports*, 1929, Section L; Interim Report of Committee on Formal Training. It is hoped to present a second and fuller report in 1930.

cricketer finds it hard to resist the impulse to drive a tennis ball along the ground.

In memorising, transfer may be positive or negative. Obviously, we wish where possible to cause positive transfer. What are the factors which bring this about? They may be briefly summarised thus.

- (a) The setting-up of special habits, where the habits required in the second, unpractised performance are similar to those in the first, practised one. Practice in learning English poetry may instil the habits of reading it aloud clearly, of appreciating its rhythm, of accentuating the "swing," of reading the poem as a whole, and thoughtfully, before you begin to learn by heart. Some of these habits may suit the learning of French poetry. But some habits may transfer "negatively," a possibility, I suspect, in our present example.
- (b) Learning good methods. If you have learned to take good notes at a lesson or a lecture, to group facts, to distinguish them from inductions, conclusions and speculations, to describe material in your own words, to write up notes in

striking and pleasing ways ; all these methods which you have learned, say, in history, may be useful when you begin to study another subject. Yet remember, again, the possibility of negative transfer. A student who can take good notes in a physical laboratory may make excellent notes in a psychological one. But unless he grasps that while the mental processes of his partner in the physical laboratory are usually of little importance in the record of a physical experiment, they may be all-important in that of a psychological investigation, he, for this purpose, is so much the worse for his previous training.

- (c) Acquiring knowledge of facts, which can be used in widely different situations.

If you are taught the geography of France by an interesting "live" method, it will be useful if you go there. But it would also help you in Spain or Italy, for, though you have not studied those countries you may have learnt the use of maps, the compass, guide-books, time-tables and inquiry offices. This is universally useful knowledge.

- (d) Acquiring an attitude of liking or disliking, welcoming or fearing, confidence or

doubt towards the subject. In everyday life we often transfer an emotional attitude from persons we know to others who resemble them, and from familiar subjects to unfamiliar ones. If you like a subject, particularly if you like it because you are good at it, you will be prepared to like one which resembles it. A boy who dislikes arithmetic is often prepared in advance to dislike algebra. A boy who likes chemistry is often ready to like physics, perhaps even to work at the difficult mathematics which it demands.

Your teacher may have inculcated in you the attitude of trying to break up or analyse any new problem ; and regarding that early breaking-up as interesting and exciting, and muddling through as stupid. Other teachers, actively or passively, may have encouraged the muddling attitude. Both the analytic and the " bull-at-a-gate " attitude may and *do* transfer to other situations.

You may have acquired an attitude leading you to search for better methods and higher standards of performance, even when early success has rewarded you. You have been well taught if you can transfer, from one subject to another,

the attitude of *healthy* dissatisfaction with your own performances. This is not believing that you will never be better, or that your performance is so bad that you need not try. It is not being satisfied with small things.

Usually, then, you will not improve your memory for one subject by learning another. But when the experiences connected with the two subjects have common factors, of material, of method, of attitude, this is possible. However intelligent and keen you are, your teachers can probably help you to grasp the common factors more easily and completely.

Since we must finish some time, we will finish here. Acquiring a knowledge of facts and methods is good ; acquiring attitudes and ideals, which will help you and others in life, is better. And of these attitudes there is much to be said for this one towards study ; that while study demands hard work, patience and courage, it is one of the very fine arts.

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